

Terrestrial Animal Health Standards Commission Report September 2016

DRAFT CHAPTER 6.Y.

PREVENTION AND CONTROL OF SALMONELLA IN COMMERCIAL PIG PRODUCTION SYSTEMS PIG HERDS (new)

Article 6.Y.1.

Introduction

Nontyphoidal salmonellosis is one of the most common food-borne bacterial diseases in the world with *Salmonella* Enteritidis and *S. Typhimurium* (including monophasic variants) being the predominant serotypes identified in most countries. *S. Enteritidis* is primarily associated with poultry while *S. Typhimurium* may be present in many mammalian and avian hosts. These serotypes and several others occur at variable prevalence in pigs depending on the region. For example, in some countries *S. Infantis* and *S. Choleraesuis* may also cause salmonellosis in humans.

Salmonella infection in pigs is mostly subclinical, although clinical disease such as enteritis and septicaemia in weaned pigs may occur. Subclinical infection, including a carrier state, can be of variable duration and can play an important role in the spread of *Salmonella* within and between herds and pose a public health risk.

As is the case in most food-producing animals, *Salmonella* infection in pigs is mostly subclinical and of variable duration. Pigs with subclinical infection play an important role in the spread of *Salmonella* between herds and pose a public health risk.

Salmonella serotypes and their prevalence in pigs may vary considerably within and between farms, regions and countries and regions. It is important for Veterinary Authorities and the producers to consider the serotypes of *Salmonella*, their occurrence and the disease burden and their prevalence in pig and human populations when they develop and implement strategies for the prevention and control of *Salmonella* in commercial pig production systems. *Salmonella* reduction strategies.

Article 6.Y.2.

Definitions

For the purpose of this chapter:

Commercial pig production systems: means those systems in which the purpose of the operation includes some or all of the following: breeding, rearing and management of pigs for the production of meat.

Feed: means any material (single or multiple), whether processed, semi-processed or raw, which is intended to be fed directly to terrestrial animals (except bees).

Feed ingredient: means a component part or constituent of any combination or mixture making up a feed, whether or not it has a nutritional value in the animals diet, including feed additives. Ingredients are of plant (including aquatic plants) or terrestrial or aquatic animal origin, or other organic or inorganic substances.

Article 6.Y.23.

Purpose and scope

This chapter provides recommendations for the prevention and control of *Salmonella* in commercial pig production systems in order to reduce the burden of infection in pigs and the risk of human illness through food-borne contamination as well as human infections resulting from direct or indirect contact with infected pigs. To combat the occurrence of food-borne salmonellosis, a pre-harvest pathogen reduction strategy can assist in reducing the presence of *Salmonella* in pig meat.

This chapter provides recommendations on the prevention and control of *Salmonella* in domestic pigs kept for commercial breeding and production from farm to slaughter. It should be read in conjunction with the Codex Alimentarius Code of Hygienic Practice for Meat (CAC/RCP 58-2005), Code of Good Animal Feeding (CAC/RCP 54-2004), and the Guidelines for the Control of Nontyphoidal *Salmonella* spp. in Beef and Pork Meat (CAC/GL 87-2016 under development) and the Codex Alimentarius Code of Hygienic Practice for Meat (CAC/RCP 58-2005), and the OIE/FAO Guide to Good Farming Practices for Animal Production Food Safety.

Article 6.Y.3.

Surveillance in pig herds for *Salmonella*

Where justified by risk assessment, surveillance should be carried out to identify the occurrence and distribution of *Salmonella* in pig herds. Surveillance data will provide information to assist the Competent Authorities in their decision making regarding the requirement for, and design of, control programmes. Sampling and testing methods, frequency and type of samples required should be determined by the Veterinary Services based on the risk assessment.

Serological testing, usually using 'meat juice' at slaughter, is a common method for assessing exposure to *Salmonella* in pig herds. Benefits of serological testing include low cost per test, high throughput capability and the potential for automation of tests. Collection of samples at the slaughterhouse/abattoir enables centralised sampling of multiple herds. Serological testing does not detect exposure to all serotypes and does not provide information on the serotypes present.

Microbiological testing identifies serotypes present in pig herds and can provide epidemiological information on likely sources of *Salmonella* and on the presence of strains with higher public health risk, including those with enhanced virulence or resistance to antimicrobial agents. Bacteriological sampling of individual pigs has low sensitivity but this can be overcome by repeated sampling, by pooling of samples (such as individual faecal samples or mesenteric lymph nodes) or sampling naturally pooled material (such as sampling of faeces from the floor of pig pens).

Communication of the results of post-mortem *Salmonella* testing that are relevant to the *Salmonella* status of pigs at herd level to the herd manager or veterinarian is an important element of a *Salmonella* control programme.

Article 6.Y.4.

Definitions

Feed: means any material (single or multiple), whether processed, semi-processed or raw, which is intended to be fed directly to terrestrial animals (except bees).

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Article 6.Y.54.

Prevention Objectives of prevention and control measures

It is recommended that Prevention prevention and control measures be focused may focus on those serotypes of *Salmonella* of greatest consequence to pigs and public health. These measures will also contribute to the reduction of other serotypes.

Prevention and control measures in commercial pig production systems may:

- 1) reduce the prevalence and **concentration amount** of *Salmonella* entering the slaughterhouse/abattoir and therefore decrease the challenge to the slaughter and dressing procedures and the likelihood of pig meat contamination;
- 2) reduce *Salmonella* contamination of the environment via pig manure, which in turn will limit infection of animals (including wildlife);
- 3) reduce the likelihood of infections in humans through contact with infected pigs or contaminated material **or water**.

While control in the primary production phase can decrease the number of animals carrying or shedding *Salmonella*, controls after primary production are also important to minimise the contamination and cross-contamination of carcasses and meat products.

When appropriate, good farming practices and the principles of hazard analysis and critical control points (HACCP) should be taken into account when designing prevention and control measures.

Articles 6.Y.65 to 6.Y.4814 provide recommendations for the prevention and control of *Salmonella* at herd level in commercial pig production systems. Contamination of pig meat can be reduced by measures taken during the slaughter process. Reduction of *Salmonella* in pigs entering the slaughterhouse/abattoir enhances the effectiveness of such measures. These recommendations will may also contribute to the prevention and control of some have beneficial effects on the occurrence of other infections and diseases.

Article 6.Y.65.

Biosecurity measures

It is important to have biosecurity measures in place to reduce the risk of introduction of *Salmonella* or the entry of new strains of *Salmonella* into pig herds, the spread of these strains across the herd, as well as to minimise prevalence of existing strains.

Biosecurity is intended to assist with the prevention and control of *Salmonella*. The choice of specific measures will vary according to the type of commercial pig production system.

When including *Salmonella* as part of a biosecurity **management plan**, **it is recommended that** the following **should** be addressed:

It is recommended that biosecurity measures include the following:

- 1) location, design and management of the establishment. Development and implementation of a *biosecurity plan* including management strategies for the prevention and control of *Salmonella*.
- 2) veterinary supervision of pig health;
- 3) management of the introduction and mixing of pigs;
- 42) training of personnel **regarding in** their responsibilities and **the significance of** their role in improving animal health, human health, **and** **and** food safety;
- 53) maintenance of records including data on pig health, production, movements, medications, vaccination, mortality, *surveillance*, and cleaning and *disinfection* of farm buildings and equipment;
- 6) availability of test results to the farm operator when *Salmonella surveillance* is conducted;
- 4) veterinary supervision of pig health and *Salmonella* control.
- 75) removal of unwanted vegetation and debris that could attract or harbour pests around pig housing;
- 86) prevention of **minimising the** entry of wild birds into pig houses and buildings **and feed stores**;

- 97) cleaning and disinfection procedures for buildings in which pigs are handled or housed in accordance with Chapter 4.13, including feeding systems, drinkers, floor, walls, aisles, walkways, partitions between pens, and ventilation ducting. Cleaning and disinfection procedures for pig housing, general equipment, transportation equipment and animal walkways. The cleaning and disinfection procedures for pig housing after emptying should include at least feeders, drinkers, floor, walls, aisles, partitions between pens, and ventilation ducting. All visible organic material should be removed before disinfection with a suitable disinfectant at an effective concentration. Disinfectants should be used in accordance with Chapter 4.13.
- 108) control of pests such as rodents and arthropods, and regular assessment of effectiveness. Procedures for the control of vermin such as rodents and arthropods should be in place and regular checks should be carried out to assess effectiveness. When the presence of vermin is detected timely control actions should be taken to prevent the development of unmanageable populations; for example, the placement of baits for rodents where they are nesting.
- 119) Controlled access of persons and vehicles entering the establishment. control and hygienic procedures for entry and movement of persons and vehicles;
- 1240) biosecurity measures applied to all personnel and visitors entering the establishment. This As a minimum, this should include hand washing and changing into clean clothes and footwear provided by the establishment. Similar precautions are recommended when moving they move between separate epidemiological units on large farms;
- 141) vehicles and equipment identified as a risk in the biosecurity plan should be cleaned and disinfected before entering the establishment.
- 13) cleaning and disinfection of equipment and vehicles identified as posing a risk;
- 1412) pig carcasses, storage and disposal of dead animals, bedding, faeces and other potentially contaminated farm waste should be stored and disposed of in a safe manner to that minimises the risk-likelihood of dissemination of Salmonella and to prevents the direct or indirect exposure of humans, livestock and wildlife to Salmonella. Particular care should be taken when pig bedding and faeces are applied to land used to fertilise for horticultural crops intended for human consumption.
- 15) procedures for prevention of dissemination of Salmonella when animals are suspected or known to be infected.

Article 6.Y.76.

Facility Location and design of pig establishments

When making decisions on the location and design of pig establishments, it is recommended that reduction of the likelihood of transfer of pathogens, including Salmonella, from major sources of contamination should be considered. Sources of Salmonella may include other livestock establishments or areas of application or disposal of contaminated waste or effluent. Other sources and vectors of Salmonella include vehicles, equipment, water-courses, persons personnel, domestic animals, birds, rodents, flies and wildlife.

It is recommended that the The design of commercial pig production systems should consider the following:

Good design of pig units facilitates the management and control of pathogens.

It is recommended that facility design consider the following:

- 1) location proximity of other livestock establishments, in relation to and wild bird and rodent populations;
- 2) management of faecal waste to minimise contamination of the establishment;
- 32) adequate drainage for the site and control of run-off water and untreated waste water;
- 43) use of smooth impervious materials for construction of pig houses to enable effective cleaning and disinfection;

- 54) surrounding paving the area immediately surrounding indoor pig houses or indoor establishments with concrete or other impervious material, to facilitate cleaning and disinfection;
- 65) a controlled entry and movement of vehicles, equipment and persons, point to prevent the entry of unwanted animals and people; for example, locate delivery and collection points away from pig housing or feed storage;
- 7) preventing contamination of feed and water during storage and distribution;
- 6) a sign indicating restricted entry at the entrance to the establishment;
- 87) pig flow handling and movements to minimise stress and spread of Salmonella infection;
- 98) prevention of entry of wild birds, rodents and feral animals; restriction of entry of domestic animals, wild birds, rodents, flies and other relevant wildlife.
- 9) location of delivery and collection points away from pig housing or feed storage.

Article 6.Y.7.

Management of new pig introductions into the establishment

Introduction of pigs into a herd is an important risk factor, especially in moderate and high prevalence regions. To minimise the likelihood of introducing Salmonella by replacement pigs, it is recommended that:

- 1) good communication along the pig production chain should be encouraged to raise awareness of the risk of introducing Salmonella through pig introductions;
- 2) consideration should be given to minimising the number of sources for both replacement breeding stock and rearing pigs, and matching Salmonella herd status in terms of Salmonella freedom or occurrence of priority serotypes such as S. Typhimurium;
- 3) the introduction of new genetic material should be introduced through the use of semen whenever possible practicable;
- 4) if possible, pigs should be sourced directly from herds of origin because live animal markets or other places where pigs from multiple properties are mixed for resale may increase the likelihood of spread of Salmonella and other infectious agents among pigs;
- 5) newly introduced pigs should be kept separate from the rest of the herd for a suitable period before mixing with other pigs, e.g. four weeks;
- 6) where when appropriate, testing of pigs for Salmonella prior to introduction or mixing with other pigs should be considered to inform subsequent control measures, for example, when introducing pigs of unknown status.

Article 6.Y.8.

Moving and mixing of pigs

The moving and mixing of pigs increases the likelihood of spread of Salmonella. To minimise the spread of Salmonella, it is recommended that:

- 1) the number of pig movements and mixing of pigs between weaning and dispatch for slaughter should be minimised;
- 2) if possible, the 'all-in-all-out' system with a single age group of pigs should be used. In particular, the addition to younger groups of pigs held back from older groups should be avoided.;
- 3) sick pigs should be segregated from healthy ones.

Article 6.Y.89.

Feed and feed composition1. Feed and feed ingredients

Feed and feed ingredients can be sources of *Salmonella* infection for pigs. This is especially important in herds, countries or regions of low prevalence. To minimise the spread of *Salmonella* through feed, it is recommended that:

- a) feed and feed ingredients should be produced, handled, stored, transported and distributed in accordance with Chapter 6.3.;
- b) where practical when practicable, feed and feed ingredients should be transported, stored and fed in a hygienic manner that minimises contamination by manure and access by domestic animals, birds, rodents and wildlife;
- c) when practicable, feeds should be treated with heat, or with approved bactericidal or bacteriostatic treatments e.g. such as organic acids.

Salmonella-contaminated feed and feed ingredients are known to be important sources of infection for pigs. Therefore, feed and feed ingredients should be produced, handled, stored, transported and distributed according to Good Manufacturing Practices, considering Hazard Analysis Critical Control Points (HACCP) principles and recommendations in accordance with Chapter 6.3.

For the effective control of *Salmonella* it is recommended that:

- 1) Feed and feed ingredients should come from monitored sources.
- 2) Heat treated feeds are used and may also include the addition of bactericidal or bacteriostatic treatments, e.g. organic acids. Where heat treatment is not possible, the use of bacteriostatic or bactericidal treatments or processes should be considered.
- 3) Cooling systems and dust control in feed ingredient processing plants and compound feed mills should be managed to avoid recontamination of feed and feed ingredients with *Salmonella*.
- 4) Feed should be stored and transported in a hygienic manner that prevents exposure to possible residual *Salmonella* contamination.
- 5) Access to feed by wild birds and rodents should be prevented.
- 6) Spilled feed should be cleaned up immediately to remove attractants for wild birds, rodents and other pests.

2. Feed composition

When *Salmonella* is present in a pig herd, the composition of feed may influence the occurrence of *Salmonella* in individual pigs.

For the control of *Salmonella* it is recommended that the following be considered:

- a) liquid feed that is fermented or containing milk products has a protective effect due to the presence of beneficial bacteria and lowered pH;
- b) coarsely ground feed may reduce the occurrence of *Salmonella* by slowing gastric transit (thereby increasing exposure to gastric acid) and reducing dysbacteriosis. Coarsely ground feed ingredients may be fed alongside pelleted feed;
- c) fine grinding needed to produce heat treated pellets may result in dysbacteriosis which favours the colonisation and multiplication of *Salmonella* in the intestine. Therefore, heat treated pellets are most more appropriate for situations in which *Salmonella* is uncommon;
- d) when wheat is the predominant feed ingredient, reducing the proportion of this ingredient may reduce the occurrence of *Salmonella* because the rapid fermentation of wheat promotes dysbacteriosis.

Article 6.Y.9.10.

Water

For the effective control ~~Drinking water~~ Water for drinking should be of an appropriate quality. To minimise the spread of *Salmonella* through water, it is recommended that:

- 1) the drinking water supply should be monitored and controlled to maintain it free from *Salmonella* contamination;
- 2) water holding tanks are ~~should be~~ enclosed;
- 3) ~~water supply and delivery systems should not be accessible to birds, rodents, or wildlife;~~
- 4) the water delivery system is ~~should be~~ regularly cleaned and disinfected. For example in an 'all-in-all-out' system this ~~would occur~~ before restocking.

Article 6.Y.10.

Feed composition

For the control of *Salmonella* it is recommended that the following be considered when determining feed composition:

- 1) slower gastric transit time of ingested feed increases exposure of *Salmonella* to stomach acid resulting in decreased survival.
- 2) modified fermentation conditions in the gastrointestinal tract may enhance colonisation by protective bacteria and thereby suppress the colonisation and multiplication of *Salmonella*.
- 3) liquid feed that is fermented has a protective effect due to the presence of beneficial bacteria and low pH levels; for example, the inclusion of fermented milk products.

Where *Salmonella* is present in a pig herd, the composition of feed may influence the occurrence of *Salmonella* in individual pigs. For the effective control of *Salmonella* it is recommended that:

- 4) feed should be coarsely ground.
- 5) where feed is wheat based, reducing the proportion of wheat may reduce the occurrence of *Salmonella* in pigs.
- 6) coarsely ground material may be added to pelleted feed.

Article 6.Y.11.

Pig flow management

The movement and mixing of pigs increase the risk of spread of *Salmonella*. For the effective control of *Salmonella* it is recommended that:

- 1) The number of pig movements and mixing of pigs between weaning and dispatch for slaughter should be minimised.
- 2) If possible, the 'all-in-all-out' single age group principle should be used. In particular, the addition to younger groups of pigs held back from older groups should be avoided.

Article 6.Y.12.

Management of new pig introductions

To minimise the risk of new introductions of *Salmonella* in replacement pigs in a herd, it is recommended that:

- 1) There is good communication along the pig production chain to ensure that steps are taken to minimise the introduction and dissemination of *Salmonella*.
- 2) A closed herd policy is applied with the introduction of new genetic material by semen only.
- 3) The number of separate sources for both replacement breeding stock and rearing pigs are as few as possible.

- 4) Newly introduced pigs are kept separate from the rest of the *herd* for a suitable period before incorporating with other pigs, e.g. four weeks.
- 5) Replacement breeding pigs are of a similar *Salmonella* status to that of the *herd*, for example a *Salmonella* free *herd* should source replacements from *Salmonella* free *herds*; or *herds* that are free of specific *Salmonella* serotypes such as S. Typhimurium should avoid introducing pigs from breeding *herds* infected with such serotypes.
- 6) Where appropriate, pooled faecal samples from introduced pigs are taken to assess their *Salmonella* status.

Article 6.Y.13.

~~Stress reduction~~

Given that stress may increase the multiplication and shedding of *Salmonella* by pigs and their susceptibility to infection, it is important to consider management measures that reduce stress.

Article 6.Y.14~~11~~.

~~Pig treatments~~ Additional prevention and control measures

- 1) Vaccination may be considered as part of a *Salmonella* control programme. Vaccine production and use should be in accordance with Chapter 1.1.6. of the *Terrestrial Manual*. The protective effect of vaccines is generally serotype-specific and is influenced by factors such as timing of vaccination in relation to exposure.

- 2) Antimicrobial agents may modify normal flora in the gut and increase the likelihood of colonisation by *Salmonella*. In circumstances when antimicrobial agents are considered necessary for the treatment of clinical enteric salmonellosis, they should be used in accordance with Chapter 6.9. Antimicrobial agents can be used for treatment of clinical salmonellosis and when administered, it should be in accordance with Chapter 6.9. Furthermore However, antimicrobial agents should not be used to control subclinical infection with *Salmonella* in pigs because the effectiveness of the treatment is limited, they may increase the risk of *Salmonella* colonisation, and their use can contribute to the development of antimicrobial resistance.

Antimicrobial agents may modify normal flora in the gut and increase the likelihood of colonisation by *Salmonella*. If antimicrobial agents are used for the control of clinical infections in pigs, they should be used in accordance with Chapters 6.7., 6.8., 6.9. and 6.10.

Antimicrobial agents should not be used to control subclinical infection with *Salmonella* in pigs because the effectiveness of the treatment is limited and can contribute to the development of antimicrobial resistance.

- 2) Vaccination may be used as part a *Salmonella* control programme. Vaccine production and use should be in accordance with Chapter 2.9.9. of the *Terrestrial Manual*.

Vaccines for *Salmonella* in pigs may increase the threshold for infection and reduce the level of excretion of the organism. The protective effect of vaccines is serotype specific and few licensed vaccines are available for pigs.

If serology is used as the surveillance method, it may not be possible to distinguish between vaccination and infection with a field strain.

If live vaccines are used:

- a) it is important that field and vaccine strains be easily differentiated in the laboratory;
 - b) the vaccine strain should not be present at the time of slaughter.
- 3) Where approved by the Competent Authority, Organic organic acids, probiotics and prebiotics may be added to feed or water to reduce shedding of *Salmonella* by pigs. However, efficacy is variable.

Article 6.Y.15~~12~~.

Transportation

Hygienic maintenance of vehicles is recommended. Vehicles should be properly cleaned and disinfected after transportation of animals.

When transporting animals from multiple establishments, it is recommended that the *Salmonella* status of the establishments should be considered to avoid cross-contamination of pigs.

In addition, the relevant recommendations in Chapters 7.2., 7.3. and 7.4. apply.

Article 6.Y.1613.

Lairage

Lairage can may be used at various stages in pig production, for example accumulation of weaned pigs before movement to nursery herds, holding finisher pigs before transport to slaughter and holding pigs at the slaughterhouse/abattoir before slaughter. Important aspects of lairage management include effective cleaning and disinfection between groups, minimising mixing of separate groups and managing stress.

Relevant aspects of lairage management include consideration of effective cleaning and disinfection between groups, minimising mixing of animals that have not continually been kept together and managing stress.

In addition, the relevant recommendations in Articles 7.5.1., 7.5.3., and 7.5.4. apply.

Article 6.Y.14.

Surveillance for *Salmonella* in commercial pig production systems

Surveillance data provide information to assist the Competent Authorities in their decision making regarding the requirement for, and design of, control programmes and in setting and verifying performance objectives. Harmonised surveillance systems to determine the occurrence of *Salmonella* at herd level are in place in some countries. Communication between slaughterhouses/abattoirs, Veterinary Services and the herd manager or veterinarian of the results of *Salmonella* surveillance systems is an important element of a *Salmonella* control programme.

Standards for diagnostic tests are described in the Terrestrial Manual. Serological testing, usually using 'meat juice' at slaughter, is one method for assessing exposure to *Salmonella* in pig herds. Benefits of serological testing include low cost per test, high throughput capability and the potential for automation of tests. Collection of samples at the slaughterhouse/abattoir enables centralised sampling of multiple herds. While serology is a useful tool for risk ranking of herds, serological testing does not detect exposure to all serotypes or differentiate between different serotypes within the serogroups included in the antigenic range of the test or the level of *Salmonella* in pigs at slaughter. If serology is used as the surveillance method, it may not be possible to distinguish between vaccinated and infected pigs by means of serological testing.

Serological testing gives no indication of excretion of *Salmonella* in the herd and does not reflect how infectious is the tested group.

Microbiological testing, with additional phenotyping or genotyping, identifies types of *Salmonella* present in pig herds and can provide epidemiological information on likely sources of *Salmonella* and on the presence of strains with enhanced virulence or resistance to antimicrobial agents. Bacteriological sampling of individual pigs has low sensitivity but this can be overcome by sampling at herd level or repeated sampling of individual animals. by pooling Pooling of samples (such as individual faecal samples or mesenteric lymph nodes) or sampling naturally pooled material (such as sampling of faeces from the floor of pig pens) will decrease the costs. Some types of *Salmonella* such as *S. Choleraesuis* can be difficult to detect using microbiological methods.

Article 6.Y.1715.

Prevention and control in low prevalence regions

In regions where *Salmonella* infection of pigs is uncommon, it may be possible to maintain low prevalence status or eliminate infection from herds through a combination of good farming practices, herd surveillance, individual testing, movement controls, or and removal of persistent carriers.

In regions where *Salmonella* infection of pigs is uncommon it may be possible to eliminate infection from individual herds by means of a test and removal policy. This can be accomplished by placing movement controls on the herd, repeated bacteriological sampling of groups of pigs and culling of persistently infected pigs. Movement controls can be lifted after two rounds of negative tests and confirmation of implementation of effective prevention and control measures as described in Articles 6.Y.5. to 6.Y.14.

~~It may be possible to attempt this approach in individual herds, for example in valuable breeding herds, in higher prevalence regions. However, the risk of reintroduction of infection must be low to achieve success with this approach. In individual herds, for example valuable breeding herds, in higher prevalence regions, the success of this approach is dependent upon a low likelihood of reintroduction of infection.~~

~~Article 6.Y.1816.~~

Outdoor pig production

~~As far as possible~~ Where practicable, the prevention and control measures described in Articles 6.Y.5. to 6.Y.1415. should also be applied to outdoor pigs in commercial pig production systems to reduce *Salmonella* infection in pigs. In addition, ~~it~~ it is recommended that:

- 1) field rotation programmes be used to minimise *Salmonella* contamination and accumulation in soil and surface water and therefore ingestion by pigs;
- 2) systems used to provide feed, and where possible water, be provided using troughs or bird proof hoppers be designed to minimise attraction of, or access by, ~~of wild birds;~~
- 3) the location of other outdoor pig herds and the concentration and behaviour of wild birds in the area be considered ~~when establishing outdoor pig herds.~~

~~Article 6.Y.19.~~

~~Live animal markets~~

~~Live animal markets pose a significant risk of spreading *Salmonella* and other infections and diseases among pigs. If possible, sourcing replacement pigs from live animal markets should be avoided. Precautions should be taken to prevent the spread of *Salmonella* from markets to pig herds by personnel or vehicles.~~

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